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Flying Operations

***CENTRIFUGE TRAINING FOR HIGH-G
AIRCREW***

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 11-4, *Flying Operations, Aviation Service*. It provides guidance and procedures for the Centrifuge Training of aircrew who are either currently flying or are selected to fly high-G aircraft (HGA). It describes the initial, qualification, and refresher centrifuge training requirements, as well as guidance and procedures for the handling of aircrew who do not satisfactorily complete this training program. AFI 11-403, *Air Force Aerospace Physiological Training Program*, complements this instruction by providing detail on the training requirements for aerospace physiologists and centrifuge technicians. AFPAM 11-419, *G-Awareness for Aircrew*, provides comprehensive information on the physiology of G-awareness. **Records Disposition.** Maintain and dispose of all records created by processes prescribed in this publication IAW AFMAN 37-139, *Records Disposition Schedule*.

The Privacy Act of 1974 affects this instruction. The authority of Title 10 U.S.C. Sections 133 and 8013 allows the collection and maintenance of this information. Forms required by this instruction and affected by the Privacy Act have appropriate Privacy Act Statements. Privacy Act System of Records Notice F044 AF SG H, Air Force Aerospace Physiology Training Programs, applies. The use of a name of any specific manufacturer, commercial product, commodity, or service in this publication does not imply endorsement by the Air Force.

This publication will be revised upon conversion of MAJCOM/MC to Air Force level forms.

SUMMARY OF REVISIONS

This revision updates centrifuge training procedures for high-G aircrew. Changes include: specification of approved centrifuge training facilities; training not required for aircrew members using the T-38 for landing currency only; inclusion of F-14 and F-18 as high G-onset rate aircraft; elimination of age and rank as determining factors for experienced rated officer; first assignment instructor pilots not included as experienced rated officer; description of initial undergraduate flying training (UFT) requirements; description of pilot instructor training (PIT) requirements; establishment of one training standard for PIT qualification; modification of first, second, and third profiles for qualification training; automatic target tracking profile for rear cockpit aircrew; notification of AFPC/DPAOT1 for fighter pipeline training fail-

ures; inclusion of AFPAM 11-419 reference; requirement for second attempt failures who are recommended for continuation training in lower G aircraft to return for complete qualification training; elimination of video tape review for qualification of flight surgeons; requirement for aircrew upgrading from a lower G capable high G onset aircraft (HGOA) to a higher G capable HGOA to requalify at the new mission design series (MDS) level; modification of first, second, and third profiles for refresher training; description of commander directed training; requirement for successful completion of commander directed evaluation criteria; requirement for evaluation statement regarding AGSM performance to be forwarded to gaining Flight Commander, and deletion of unit reporting requirements. Changed or revised material is indicated by a bar (|).

Chapter 1—INTRODUCTION	4
1.1. Purpose and Need for Centrifuge Training.	4
1.2. Formal Training Prerequisite.	4
1.3. Explanation of Terms and Abbreviations:	4
1.4. Scheduling	6
1.5. Changes.	6
1.6. Waivers.	6
Chapter 2—INITIAL TRAINING (UFT)	7
2.1. Overview.	7
2.2. Purpose.	7
2.3. Requirements.	7
2.4. Academic Instruction.	7
2.5. Centrifuge Profiles.	7
2.6. Noncompletion of Training.	7
2.7. Documentation	7
Chapter 3—PILOT INSTRUCTOR TRAINING (PIT)	8
3.1. Purpose.	8
3.2. Requirements.	8
3.3. Academic Instruction.	8
3.4. Centrifuge Profiles.	8
3.5. Noncompletion of Training.	9
3.6. Documentation.	9
Chapter 4—QUALIFICATION TRAINING	10
4.1. Overview.	10

AFI11-404 1 DECEMBER 1999	3
4.2. Requirements.	10
4.3. Noncompletion of Training.	11
4.4. Waiver Procedures.	13
4.5. Documentation	13
Chapter 5—REFRESHER TRAINING	14
5.1. Overview.	14
5.2. Applicability:	14
5.3. Requirements.	14
5.4. Noncompletion of Training.	15
5.5. Waiver Procedures.	16
5.6. Documentation	16
Chapter 6—COMMANDER DIRECTED TRAINING	17
6.1. Overview.	17
6.2. Applicability.	17
6.3. Retraining program	17
6.4. Evaluation Criteria.	17
6.5. Notification	17
Chapter 7—REPORTING	18
7.1. Overview.	18
7.2. Videotape Disposition.	18
7.3. Individual Records.	18
Attachment 1—GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION	19

Chapter 1

INTRODUCTION

1.1. Purpose and Need for Centrifuge Training. The high-G aircraft operated by today's aircrew are easily capable of causing G-induced loss of consciousness (GLOC). Optimum physical conditioning, appropriate functioning of anti-G equipment, and adequate G-oriented situational awareness are all important to aircrew G-tolerance; however, an effective anti-G straining maneuver (AGSM) is the aircrew's most significant weapon against the potentially incapacitating effects of G, adding an average of 3.5 G to aircrew resting G-tolerance. Centrifuge training has proven to be our best device for teaching the proper AGSM, as well as providing the opportunity for teaching the physiology of high-G flight and an awareness of the factors that affect an aircrew's G-tolerance from day to day.

1.1.1. Centrifuge training consists of initial acceleration exposure between the T-37 and T-38 phases in Specialized Undergraduate Pilot Training (SUPT) and between Strike Core and Strike/Fighter phases in Joint Specialized Undergraduate Navigator Training (JSUNT). Qualification training takes place prior to introduction to fighter fundamentals (IFF) and as required for HGA aircrews who did not previously complete this training. In addition, refresher centrifuge training for all HGA aircrews who are either returning from 3-plus years non-flying or who are converting from a non-high G-onset rate aircraft to a high, or higher, G-onset rate aircraft. Commander directed training is also available to address specific technique problems.

1.1.2. There is a 12-hour, automatic duty-not-involving-flying (DNIF) following any centrifuge training for individuals flying as the primary aircraft crewmember.

1.1.3. The purpose of centrifuge training is to enhance combat capability and safety through the following methods:

1.1.3.1. Evaluate aircrew AGSM in a controlled environment.

1.1.3.2. Increase aircrew awareness of the potentially incapacitating effects of G-induced loss of consciousness.

1.1.3.3. Optimize aircrew defense against GLOC.

1.1.3.4. Improve aircrew performance under G-stress.

1.1.3.5. Identify aircrew with low G-tolerance.

1.2. Formal Training Prerequisite. Attendance of the appropriate centrifuge training program is a prerequisite for entry into all post-SUPT/JSUNT high-G aircraft formal training unit (FTU) courses. Foreign aircrews returning to their home country following formal training are exempt from this requirement. Centrifuge training is listed as ACC course number 303030.

1.3. Explanation of Terms and Abbreviations:

1.3.1. G-Awareness Training. A comprehensive program to ensure optimum G-awareness training of HGA aircrew. It consists of physiological and operational training on G-awareness, centrifuge training, and an ongoing continuation training program. This instruction addresses only the centrifuge training program. For information regarding the physiological aspects of high-G operations, see AFPAM 11-419. For information regarding continuation training requirements, see AFI 11-2F-16V1,

AFI 11-2F-15V1, AFI 11-2F-15EV1, AFI 11-2F/QF-4V1, AFI 11-2A/OA-10V1, and AFI 11-2T/AT-38V1.

1.3.2. Active High-G Aircrew . Any pilot, weapons system officer, flight surgeon, physiologist, or other aircrew assigned to an active flying billet in a high-G aircraft. The provisions of this instruction apply to all active high-G aircrews. Flight test engineers, combat camera, and aerial photographers are not required to take centrifuge training.

1.3.3. Anti-G Straining Maneuver (AGSM) . The AGSM is sustained total body muscle tensing and straining against a closed glottis in 3-second cycles.

1.3.4. Authorized Centrifuge Training Facilities .

1.3.4.1. As of 1 January 1999 are:

1.3.4.1.1. Physiological Training Center, Holloman AFB, New Mexico

1.3.4.1.2. Brooks AFB, Texas is an authorized training facility for flight surgeons, aerospace medicine primary students, aerospace physiologists, and PIT students.

1.3.4.1.3. Foreign aircrews may use facilities as defined by AFI 11-403.

1.3.4.2. Prior to 1 January 1999:

1.3.4.2.1. Physiological Training Center, Holloman AFB, New Mexico

1.3.4.2.2. Initial/qualification training conducted at the following bases: RNLAU Unit Soesterberg AB, Netherlands; Tachikawa AB, JA; Warminster Navy Centrifuge, PA; and Brooks AFB, TX; is acceptable with appropriate official documentation.

1.3.5. High-G Aircraft (HGA). Aircraft capable of generating a G-loading in excess of 4.0. This definition is further divided into the following two categories:

1.3.5.1. High G-Onset Rate (HGOR). Capable of rapid G-onset rates and sustained G-loading of greater than 6.0. Current aircraft which meet this definition are the A-10, AT-38, F-4F, F-5, F-14, F-15, F-16, F-18, F-22, and T-38.

1.3.5.1.1. Aircrew that use the T-38 aircraft for landing currency only do not require centrifuge training.

1.3.5.2. Low G-Onset Rate (LGOR). All other HGA that do not meet the HGOR definition.

1.3.6. Profiles . A profile is one run on the centrifuge training device from start (idle) to stop (return to idle or stop). Gradual onset rate is 1/10th G per second, moderate onset rate is 1-3 Gs per second, and rapid onset rate is 6 Gs per second.

1.3.7. AF Form 702, Individual Physiological Training Record . This form tracks all physiological and centrifuge training, and is maintained within the aircrew's flight records.

1.3.8. Experienced Rated Officer. For the purposes of this instruction only, an experienced rated officer is defined as a rated officer who:

1.3.8.1. Has logged greater than 1,000 hours in HGOA aircraft.

1.3.8.2. This does not include first assignment instructor pilots (FAIP).

1.3.9. Failure .

1.3.9.1. First attempt failure is an individual who fails to meet standards in accordance with paragraph 3.5.1 or 4.3.1.

1.3.9.2. Second attempt failure is an individual who returns within 60 – 180 days and does not meet standards.

1.4. Scheduling (*Holloman AFB unit only*). The 49 ADOS/SGGFT, Physiological Training Center, Holloman AFB, New Mexico, schedules all centrifuge training for their facility. The 49th Physiological Training Center will publish and distribute a quarterly schedule to all HGA major commands (MAJCOM), numbered Air Forces (NAF), Air National Guard (ANG)/DO, and the Air Force Personnel Center (AFPC)/DPMRO. Training quotas are filled on a "first-come; first-served" basis. Contact the Physiological Training Center directly at DSN 867-5760 to reserve slots.

1.5. Changes. Forward recommendations for changes to the MAJCOM office of primary responsibility (OPR) or ANG/DO on an AF Form 847, **Recommendation for Change of Publication**. AFMOA/SGOA will staff and coordinate all changes to this instruction. The MAJCOM/DO is the approval authority for changes to the MAJCOM supplemental instruction.

1.6. Waivers. Waivers to this instruction are not authorized beyond those discussed within chapters 4 and 5 of this instruction.

Chapter 2

INITIAL TRAINING (UFT)

2.1. Overview. A timely, effective AGSM is crucial to survival in the sustained high-G environment. This program provides students basic G-awareness and AGSM skills which are reinforced during daily flight training.

2.2. Purpose. UFT centrifuge training exposes students selected for the fighter track to the demands of sustained high-G flight. While the primary purpose of this training is to refine the aircrews' AGSM in a controlled environment, the demands of the centrifuge also reinforce the importance of physical and mental preparation necessary in the high-G environment. This training is familiarization only – no pass/fail standard needs to be achieved.

2.3. Requirements. All students identified for training according to AETC Syllabus P-V4A-A, **Specialized Undergraduate Pilot Training (T-38), Fighter/Bomber, and USAF students identified for training in CNATRAINST 1542.121, Advanced NFO/AFNAV Strike/Fighter**, will attend this training.

2.4. Academic Instruction. Conduct a minimum of 1 hour of platform academic instruction detailing proper AGSM execution and protection offered by current anti-G equipment. Accomplish a comprehensive video debrief with all students after exposure to centrifuge training profiles.

2.5. Centrifuge Profiles. All aircrew will train in the 13-degree seat. Accomplish the following training profiles in the order listed:

2.5.1. First Profile. Gradual onset run to 4 Gs for 20 seconds. The purpose of this run is to stimulate the cardiovascular reflex and acquaint the student with the anti-G suit. The anti-G suit will be turned on for this and all subsequent runs.

2.5.2. Second Profile. Moderate onset run to 5 Gs for 30 seconds. The purpose of this run is to practice the AGSM at a reduce onset rate.

2.5.3. Third Profile. Rapid onset run to 6 Gs for 30 seconds. The purpose of this run is to further practice the AGSM at a rapid onset rate

2.5.4. Rapid onset run to 7.5 Gs for 15 seconds. The purpose of this run is to establish aircrew confidence in their ability to operate in the high-G environment.

2.5.5. Fifth Profile. Rapid onset run to 6 Gs for 10 seconds in the “check six” position.

2.6. Noncompletion of Training. Handle noncompletion of training due to factors beyond the aircrew's control according to paragraph 4.3. The aerospace physiologist conducting the training will report poor performance to the aircrew's unit commander so additional emphasis on AGSM performance and physical conditioning can be incorporated into the aircrew's training program.

2.7. Documentation . A qualified aerospace physiologist will document completion of training on AF Form 702, **Individual Physiological Training Record**. Document training as “UFT Centrifuge”. An evaluation statement regarding AGSM performance will be forwarded to the gaining Flight Commander to be included in the students UFT gradebook.

Chapter 3

PILOT INSTRUCTOR TRAINING (PIT)

3.1. Purpose. G-awareness and centrifuge training during PIT are designed to increase the G-awareness knowledge level of instructor pilots (IP) so they can better instruct G-awareness to undergraduate flying training students. Students must develop a proper AGSM, which becomes an instinctive reaction to the anticipation of the onset of G. IPs will be able to critique a student's AGSM and set a positive example with an effective AGSM. IPs will also be able to discuss with students the problems of flying in the high-G environment and how to prevent GLOC. Proactive IPs, completely knowledgeable in G-awareness and capable of instructing solid AGSMs, will positively affect student performance and safety in the high-G environment.

3.2. Requirements. All T-3, T-37, and T/AT-38 PIT aircrew must attend the academic instruction on G-awareness. Those pilots who have not flown HGA within 3 years or have not completed centrifuge qualification training are required to attend centrifuge training as described in paragraph 3.4. T-3 IPs do not require centrifuge training, but require only academic instruction within 90 days of being assigned to the T-3 aircraft.

3.3. Academic Instruction. Conduct academic instruction according to AETC IG F-V5A-A/B-CT-IG, **G-Awareness and Centrifuge Training**, covering the effects of acceleration forces on mobility and circulation, characteristics of GLOC, and protection offered by AGSM techniques and current and future anti-G systems. Aerospace physiologists will also provide instruction on the techniques of an effective AGSM, common errors in performing an AGSM, and instructing and critiquing an AGSM. The instructional session will also include an interactive discussion of the impact of physical conditioning, lifestyle, and proper nutrition on individual G-tolerance and the effectiveness of the AGSM.

3.4. Centrifuge Profiles. All T-37 student IPs will train without an anti-G suit. Configure the seat in the 13-degree position. All T-38 student IPs will wear an anti-G suit; configure the seat in the 13-degree position. International students will train using the profile most appropriate to their follow-on aircraft. Videotape all profiles. Each pilot will receive a thorough debrief after the completion of all profiles. Accomplish the following training profiles in the order listed:

3.4.1. First Profile. Gradual onset run to second peripheral light loss (after initiation of AGSM) or 7 Gs, whichever occurs first. The T-38 student IPs will not have the anti-G suit turned on for this run. The purpose of this run is to determine the pilot's resting G-tolerance (established by first peripheral light loss) and the effectiveness of the AGSM (straining tolerance to second light loss or 7 Gs).

3.4.2. Second Profile. Rapid onset run to 4.5 Gs (5.5 Gs for T-38) for 20 seconds. The T-38 student IPs will have the anti-G suit turned on for this run and the remaining centrifuge profiles. The purpose of this run is to practice the proper AGSM.

3.4.3. Third Profile. Rapid onset run to 5.5 Gs (T-37) or 7 Gs (T-38) for 15 seconds. If the student IP cannot achieve the standard, debrief him or her, provide information on physical conditioning, and schedule additional training. (See paragraph 3.5.1.)

3.4.4. Fourth Profile. Rapid onset run to 4 Gs (T-37) or 5 Gs (T-38) for 10 seconds during "check six" position.

3.4.5. Fifth Profile. Rapid onset run to 3.5 Gs (T-37) or 4.5 Gs (T-38) for 15 seconds, using muscle tensing but no respiratory strain. Recognizing that an IP performs many G maneuvers which do not require the protection of the full AGSM, this profile is designed to teach the proper technique under those conditions. The IP is taught to begin any G maneuver with the full AGSM then decrease the strain to an “as needed” level. The student IP will demonstrate that he or she can talk while combating the effects of low G maneuvering with muscle tensing only. Do not teach this technique to undergraduate flying students.

3.5. Noncompletion of Training. If incomplete due to factors beyond the aircrew’s control, the only action required is to reschedule training.

3.5.1. First Attempt Failure . Failure to meet minimum training standard will result in noncompletion of training. Do not medically ground the pilot following the first attempt beyond the 12-hour automatic DNIF. Complete the following procedures for each student IP who does not pass the minimum standard during the first training session.

3.5.1.1. Notification . The aerospace physiologist will notify the squadron commander in writing of the noncompletion of training.

3.5.1.2. Retraining . Within 1 week, the individual’s flight commander will ensure the student IP is scheduled for additional training. Aerospace physiologist will conduct this training and it will include a review of the student IP’s videotape and data from the first training attempt, a review of the proper AGSM, a review of the physical conditioning program provided, and a discussion of lifestyle factors which affect G-tolerance. Flightline activities will support the retraining process.

3.5.1.3. Scheduling Second Centrifuge Run . Schedule the student IP for a second attempt with the next PIT class going through training (approximately 5 weeks). The T-37 profile will consist of a warm-up and AGSM practice as directed by the aerospace physiologist. The T-37 student IP will then complete 5.5 Gs for 15 seconds without an anti-G suit. The T-38 profile will consist of a warm-up and AGSM practice as directed by the aerospace physiologist. The T-38 student IP will then complete 7 Gs for 15 seconds with an anti-G suit.

3.5.2. Second Attempt Failure.

3.5.2.1. Physiologist will notify the student IP’s squadron commander in writing of the second attempt failure. The student is DNIF until evaluated by a flight surgeon. Conduct medical and operational review with the following individuals present: student IP, flight commander, squadron commander or operations officer, centrifuge instructor, and flight surgeon. The goal of this review is to establish a retraining program.

3.6. Documentation. A qualified aerospace physiologist will document completion of training on AF Form 702, **Individual Physiological Training Record**. Document as “PIT Centrifuge”.

Chapter 4

QUALIFICATION TRAINING

4.1. Overview. Qualification training is a one-time requirement for all active HGA aircrews. Experienced rated officers (as defined in this instruction) will be trained to the refresher level described in chapter 5. Aircrews who fail their first attempt at qualification training will attend the retraining program between 60-180 days from first failure.

4.2. Requirements. Completion of all training prescribed by this section is required; except, in the event of equipment malfunction, training may be completed without profiles 4 or 5. Only physiologists assigned at authorized centrifuge units are approved to document training completion on the AF Form 702, **Individual Physiological Training Record**. Training consists of the following:

4.2.1. Platform Academic Instruction . Minimum 2 hours of platform academic instruction covering the effects of acceleration forces on mobility and respiration, characteristics of GLOC, techniques of an effective AGSM, and protection offered by current and future anti-G systems. Also, included will be an interactive discussion of the impact of physical conditioning, lifestyle, and proper nutrition on individual G-tolerance and on the effectiveness of the AGSM.

4.2.2. Five Centrifuge Profiles . F-16 candidates will train in the 30-degree reclined seat. All other aircrews will train in the 13-degree upright seat. The maximum G identified in each profile will be adjusted for MDS specific requirements. All profiles will be videotaped. The following are the training profiles and will be accomplished in the order listed:

4.2.2.1. First profile. Gradual onset run for 20 seconds after initiation of AGSM with a minimum of 7 or 8 Gs (F-16) and a maximum of 8 or 9 Gs (F-16). The purpose of this run is to determine the aircrew's resting G-tolerance (established by first peripheral light loss while relaxed or prior to initiation of AGSM), determine the effectiveness of the AGSM, as well as provide a cardiovascular warm-up. The G-suit is worn but not functional for this run.

4.2.2.2. Second profile. Rapid onset run to 6 Gs for 30 seconds. The purpose of this run is to practice the proper AGSM. The G-suit is on for this and all subsequent runs.

4.2.2.3. Third profile. 15 second qualifying run. Rapid onset run to 8.5 Gs for F-15 C/D, 9 Gs for F-16, and 7.5 Gs for all other MDS. Satisfactory completion of this profile is mandatory to complete training.

4.2.2.4. Fourth profile. Rapid onset run to 6 Gs for 13-degree seat and 7 Gs for 30-degree seat for 10 seconds during "check six" position.

4.2.2.5. Fifth profile. Simulated air combat maneuver. The aircrew tracks a target through a series of maneuvers at a 3 Gs minimum with maximum G and onset rate tailored to the capabilities of the aircrew's gaining aircraft. Automatic target tracking profile will be used for all rear cockpit aircrew.

4.2.3. Debrief . Aircrews will receive a verbal debrief following each profile, with emphasis on improving each aircrew's AGSM. The overall debrief will include a review of the aircrew's videotape with emphasis on the AGSM and, if warranted, a written recommendation to the aircrew for a tailored conditioning program designed to increase the individual's potential G-tolerance.

4.3. Noncompletion of Training. If training is incomplete due to factors beyond the aircrew's control, no action is required beyond rescheduling training. Recommendation for noncompletion due to aircrew performance is made by the aerospace physiologist who monitored the individual's training. The training facility chief is the final authority for determining noncompletion. Once this recommendation is validated, the procedures in this section will be implemented.

4.3.1. First Attempt Failure :

4.3.1.1. Notification . The centrifuge facility chief will notify the aircrew's commander in writing of the failure and provide a copy of the aircrew's training report and the tailored conditioning program recommended in the debrief. HQ AFPC/DPAOT1 must be notified of fighter pipeline training failures. The centrifuge facility chief may recommend flight restrictions for aircrew whose centrifuge performance indicates a significantly higher propensity for G-induced problems. MAJCOM or ANG notification for first time failures is not required.

4.3.1.2. Grounding . Aircrews are not medically grounded following their first attempt at initial training beyond the 12-hour automatic DNIF.

4.3.1.3. Restrictions . There is no automatic restriction following first-attempt failure. Following review of the centrifuge training record and consultation with the flight surgeon and centrifuge facility chief, the squadron commander may restrict pilot aircrews from solo high-G operations until successful completion of centrifuge retraining.

4.3.1.4. Conditioning program. The aircrew's commander or commander-designated representative will monitor the aircrew's progress in the conditioning program. Aircrews must be afforded sufficient opportunity (minimum three times per week) to work on their individual conditioning program. Aircrews who have weight training recommended as part of this program should follow guidance in AFPAM 11-419, **G-Awareness for Aircrew** and seek assistance from local physiological training officer in implementing their program.

4.3.1.5. Scheduling centrifuge retraining . Retraining will be scheduled for 60-180 days following the aircrew's initial training. The commander and flight surgeon will review the aircrew's progress in the conditioning program prior to scheduling retraining. Aircrews are grounded on the 181st day following their first attempt until satisfactory completion of retraining or MAJCOM/DO or ANG/DO waiver is approved.

4.3.1.6. Retraining program . The retraining program is only conducted at authorized centrifuge training facilities. A qualified aerospace physiologist will conduct or monitor the complete retraining program. This program is 3 days in duration and consists of the following:

4.3.1.6.1. Review videotape and data from AF Form 699, **Physiological Training Record** from the first training attempt.

4.3.1.6.2. Review of progress made during individual conditioning program.

4.3.1.6.3. Academics tailored to the individual's original problem areas.

4.3.1.6.4. Centrifuge training profiles tailored to the individual's needs. The purpose of these profiles is to work on the aircrew's specific problem areas as identified in initial training. Additional warm-up profiles will be provided as necessary to prepare the aircrew for reaccomplishment of the qualification profile. Once the aircrew satisfactorily completes this profile,

the AF Form 702, **Individual Physiological Training Record** will be signed and no further training is necessary.

4.3.2. Second Attempt Failure: (*aircrew fails retraining program*)

4.3.2.1. Notification . The centrifuge facility chief will notify the aircrew's commander in writing and provide an information copy to the MAJCOM/DOT/SGP or ANG/DOO/SGP of the aircrew's failure to complete retraining. Notification must include the reasons for the failure and should include any recommendations that might be beneficial in determining the future training ability of the aircrew.

4.3.2.2. Grounding and medical evaluation . Aircrews are medically grounded pending completion of a medical evaluation by a qualified flight surgeon. The purpose of this evaluation is to determine if there is any underlying pathology that caused or contributed to the aircrew's failure to complete training. Results of this evaluation will be provided to the unit commander and the MAJCOM/SGP or ANG/SGP. Following satisfactory completion of treatment (if underlying pathology was a factor), recommendation by the attending flight surgeon, and concurrence by the MAJCOM/SGP or ANG/SGP, the aircrew may reattempt qualification centrifuge training without prejudice. If no underlying pathology was discovered, then the remaining procedures in this section will be implemented.

4.3.2.3. Restrictions . Following successful completion of a medical evaluation, aircrews may, with commander approval, resume limited flying duties. Pilots will not fly solo or as pilot-in-command, instructor, or flight examiner until completion of an operational review and approval of a MAJCOM/DO or ANG/DO waiver.

4.3.2.4. Operational review. The aircrew's operations group commander or equivalent will conduct a unit-level operational review. The purpose of this review is to provide a recommendation to the MAJCOM/DO or ANG/DO as to whether the aircrew should receive a waiver to continue in their weapons system. The operations group commander must consider the aircrew's flying skill and experience, then determine the aircrew's potential to develop into a successful high-G aviator. If the aircrew is converting from a low to a high G-onset rate aircraft, or is new to HGA aviation, then the operations group commander will recommend either retaining the aircrew in a lower G system or approval to continue in HGA conversion. The operations group commander's recommendation will be sent to the MAJCOM/DO or ANG/DO within 60 days of the aircrew's failure of retraining.

4.3.2.4.1. If continuation in lower G aircraft is recommended, the aircrew must return to the centrifuge training facility and complete the qualifying profile for the new MDS. This requirement applies only to HGA listed in 1.3.5.1

4.3.2.5. MAJCOM/ANG review . The MAJCOM/SGP or ANG/SGP will review the centrifuge training reports, recommendations, the medical evaluation report, and the aircrew's centrifuge training videotapes (if desired). Based on the medical and physiological review, the MAJCOM/SGP or ANG/SGP will provide a recommendation to the MAJCOM/DOT or ANG/DOO as to the aircrew's potential to tolerate the high-G environment. The MAJCOM/DOT or ANG/DOO will review the operations group commander and MAJCOM/SGP or ANG/SGP recommendations and prepare a consolidated position to the MAJCOM/DO or ANG/DO. The MAJCOM/DO or ANG/DO is the final authority in determining whether the aircrew is retained in their weapon system,

whether approved to continue conversion, or if the aircrew should be reassigned to a low-G weapon system.

4.4. Waiver Procedures. Waiver requests must be by name and submitted in writing with appropriate justification through the MAJCOM/DO to the NAF/DO. NAF will screen requests and recommend concurrence or nonoccurrence to the MAJCOM/DO. All requests for waivers for the ANG will be submitted directly to the ANG/DO. The MAJCOM/DO or ANG/DO is the final waiver authority.

4.4.1. Waivers to initial training will be considered for the following circumstances:

4.4.1.1. Unit is converting from low-G to high-G aircraft and aircrew will not convert.

4.4.1.2. Aircrew is separating from the Air Force or retiring within 90 days (6 months for ANG aircrew) of when the aircrew would otherwise be required to attend training.

4.4.1.3. Aircrew failed initial and retraining, but was recommended to continue in HGA (paragraph 4.3.2.5.). An approved waiver to the training requirement also constitutes a waiver to the formal course entry prerequisite for aircrews who are enrolled in or enroute to a formal training course.

4.5. Documentation . A qualified aerospace physiologist will document completion of training on AF Form 702, **Individual Physiological Training Record**. Documentation will reflect MDS specific qualification, “AFI 11-404 Qualification Centrifuge Training Complete, 9 Gz” (F-16), “AFI 11-404 Qualification Centrifuge Training Complete, 8.5 Gz” (F-15C), or “AFI 11-404 Qualification Centrifuge Training Complete, 7.5 Gz”(all other HGOA). An evaluation statement regarding AGSM performance will be forwarded to the gaining IFF Flight Commander to be included in the IFF gradebook.

Chapter 5

REFRESHER TRAINING

5.1. Overview. Refresher training is designed for aircrews who are being reassigned to high-G aircraft following a nonflying assignment or who are converting from an LGOR aircraft to a HGOR aircraft. Refresher training requires aircrew to qualify at the MDS qualifying G level (chapter 4).

5.2. Applicability:

5.2.1. All experienced rated officers who have not previously completed qualification training.

5.2.2. Aircrews returning to HGA from 3 or more years in a nonflying position or converting to a HGOR aircraft from 3 or more years in a LGOR. The 3 years are counted from the last flight as an active high-G aircrew in a HGOR aircraft (or since last completing centrifuge training) to formal course entry date (report not-later-than for aircrews who won't attend a formal course en route to their gaining unit).

5.2.3. Aircrew upgrading from a HGOA rate to a higher G qualifying onset aircraft (i.e. aircrew converting from A-10 to F-16 must retrain at 9 Gs for 15 seconds; however, aircrew converting from F-16 to F-15 do not need to requalify, unless specified under paragraph 5.2.2).

5.2.3.1. Aircrew transitioning from the F-15C/D to the F-16 do not require centrifuge training unless required by 5.2.1, 5.2.2, or 5.2.4.

5.2.4. Aircrews on MAJCOM and ANG waivers for failure of qualification training (paragraph 4.4.1.3) require refresher training every year or until aircrew passes MDS specific qualifying profile. Once qualification training profiles are successfully completed, the aircrew's AF Form 702, **Individual Physiological Training Record**, will be documented accordingly; the waiver will be rescinded; and no further refresher training will be required (unless directed by paragraph 5.2.3 or chapter 6).

5.3. Requirements. Completion of all training prescribed by this section is required; except, in event of an equipment malfunction, training may be completed without profiles 3 or 4. Training consists of the following:

5.3.1. Platform Academic Instruction. Minimum 2 hours of platform academic instruction covering the effects of acceleration forces on mobility and respiration, characteristics of GLOC, techniques of an effective AGSM, and protection offered by current and future anti-G systems. Also, included will be an interactive discussion of the impact of physical conditioning, lifestyle, and proper nutrition on individual G-tolerance and on the effectiveness of the AGSM.

5.3.2. Four Centrifuge Profiles . Aircrews currently flying or converting to the F-16 will train in the 30-degree reclined seat. All other aircrews will train in the 13-degree upright seat. All profiles will be videotaped. The following are refresher training profiles and will be accomplished in the order listed:

5.3.2.1. First profile. Gradual onset run to 15 seconds beyond relaxed G-tolerance or to second peripheral light loss (6 Gs minimum). The maximum G level will be 8 Gs or 9 Gs (F-16). The purpose of this run is to determine the aircrew's resting G-tolerance, acts as a cardiovascular warm-up, and to determine the effectiveness of the AGSM. The G-suit is worn but is not functional for this run.

5.3.2.2. Second profile. Rapid onset run to MDS specified qualification profile (paragraph 4.2.2.3) for 15 seconds. The purpose of this run is to demonstrate the proper AGSM. The G-suit is connected for this and all subsequent runs. Satisfactory completion of this profile is mandatory to complete training.

5.3.2.3. Third profile. Rapid onset run to 6 G for 10 seconds during "Check 6" position.

5.3.2.4. Fourth profile. Simulated air combat maneuver; the aircrew tracks a target through a series of maneuvers at a 3 G minimum and 7 G maximum (8 Gs F-16). Automatic target tracking profile will be used for all rear cockpit aircrew.

5.3.3. Debrief . Aircrews will receive a verbal debrief following each profile, with emphasis on improving the aircrew's AGSM. The overall debrief will include a review of the aircrew's videotape with emphasis on the AGSM and, if warranted, a written recommendation to the aircrew for a tailored conditioning program designed to increase the individual's potential G-tolerance.

5.4. Noncompletion of Training. If training is incomplete due to factors beyond the aircrew's control, no actions are required beyond rescheduling of training. Recommendation for non-completion due to aircrew performance is made by the aerospace physiologist who monitored the individual's training. The training facility chief is the final authority for determining non-completion. Once this recommendation is validated, the procedures in this section will be implemented.

5.4.1. Notification . The centrifuge facility chief will notify the aircrew's commander in writing of the failure and provide a copy of the aircrew's training report and the tailored conditioning program recommended in the debrief.

5.4.2. Grounding . Aircrews are not medically grounded following refresher training beyond the 12-hour automatic DNIF.

5.4.3. Restrictions . There is no automatic restriction following failure of refresher training. Following a review of the centrifuge training record and consultation with the flight surgeon and the centrifuge facility chief, the squadron commander may restrict pilot aircrews from solo high-G operations until successful completion of an operational review.

5.4.4. Conditioning Program . The aircrew's commander or commander-designated representative will monitor the aircrew's progress in the conditioning program. The aircrew must be afforded sufficient opportunity (minimum 3 times per week) to work on their individual conditioning program. Aircrews who have weight training recommended as part of this program should seek guidance in AFPAM 11-419 and assistance in establishing their program.

5.4.5. Operational Review . The aircrew's operations group commander or equivalent will conduct a unit-level operational review. The purpose of this review is to provide a recommendation to the MAJCOM/DO or ANG/DO as to whether the aircrew should receive a waiver to continue in their weapons system. The operations group commander must consider the aircrew's flying skill and experience, then determine the aircrew's potential to develop into a successful high-G aviator. If the aircrew is converting from a low to a HGOA, or is new to HGA aviation, then the operations group commander will recommend either retaining the aircrew in a lower G system or approval to continue in HGA conversion. The operations group commander's recommendation will be sent to the MAJCOM/DO or ANG/DO within 60 days of the aircrew's failure of retraining.

5.4.6. MAJCOM/ANG review . The MAJCOM/SGP or ANG/SGP will review the centrifuge training reports and recommendations and the medical evaluation report, and they may review the aircrew's centrifuge training videotapes (if desired). Based on the medical and physiological review, the MAJCOM/SGP or ANG/SGP will provide a recommendation to the MAJCOM/DOT or ANG/DOO as to the aircrew's potential to tolerate the high-G environment. The MAJCOM/DOT or ANG/DOO will review the operations group commander and MAJCOM/SGP or ANG/SGP recommendations and prepare a consolidated position to the MAJCOM/DO or ANG/DO. The MAJCOM/DO or ANG/DO is the final authority in determining whether the aircrew is retained in their weapon system, whether approved to continue conversion, or if the aircrew should be reassigned to a low-G weapon system.

5.5. Waiver Procedures. Waiver requests must be by name and submitted in writing, with appropriate justification, through the NAF/DO to the MAJCOM/DO. The NAF will screen requests and recommend concurrence or non-concurrence to the MAJCOM/DO. All requests for waivers for the ANG will be submitted directly to the ANG/DO. The MAJCOM/DO or ANG/DO is the final waiver authority.

5.5.1. Waivers to refresher training will be considered for the following circumstances:

5.5.1.1. Experienced rated officer who was unable to complete training.

5.5.1.2. Other aircrews who attended training that was not in conjunction with conversion to a high-G aircraft.

5.5.1.3. Aircrews recommended to continue in HGA following their operational review.

5.5.2. An approved waiver to the refresher training requirement also constitutes a waiver to the formal course entry prerequisite for aircrews who are enrolled in or en route to a formal training course.

5.5.3. Aircrews on approved refresher training waivers do not require further centrifuge training except as directed by chapter 6.

5.6. Documentation . A Holloman AFB assigned qualified aerospace physiologist is authorized to document completion of training on AF Form 702. Documentation will reflect MDS specific qualification, "AFI 11-404 Refresher Centrifuge Training Complete, 9 Gz" (F-16), "AFI 11-404 Refresher Centrifuge Training Complete, 8.5 Gz" (F-15C), or "AFI 11-404 Refresher Centrifuge Training Complete, 7.5 Gz"(all other HGA aircraft). An evaluation statement regarding AGSM performance will be forwarded to the gaining Flight Commander.

Chapter 6

COMMANDER DIRECTED TRAINING

6.1. Overview. Commander directed acceleration training (CDAT) is a tool used by an organizational commander to evaluate and improve an aircrew's performance under Gz. Upon videotape review by flight supervision, flight surgeon, or aerospace physiologist, recommendation can be made for commander directed training.

6.2. Applicability. Any aircrew member may return at the discretion of his or her commander following an in-flight GLOC incident or when directed to improve their performance under Gs. Commanders will use the evaluation from CDAT outcome to direct follow-on training. This may include, but is not limited to, continued pipeline training, further acceleration training or removal from HGA pipeline training. Commanders directed course of action will be documented in the students gradebook.

6.3. Retraining program . The retraining program is only conducted at authorized centrifuge training facilities. A qualified aerospace physiologist will conduct or monitor the complete retraining program. This program is 3 days in duration and consists of the following:

6.3.1. Review of available in-flight tapes.

6.3.2. Review of individual conditioning program.

6.3.3. Analysis and review of individual AGSM performance.

6.3.4. Centrifuge training profiles tailored to the individual's needs. The purpose of these profiles are to work on the aircrew's specific problem areas. This may include training with COMBAT EDGE equipment.

6.4. Evaluation Criteria. Successful completion of CDAT is based on the following criteria:

6.4.1. T-37 training phase requires the individual to successfully complete 5.5 G's for 15 seconds.

6.4.2. T-38 training phase requires the individual to successfully complete 7.5 G's for 15 seconds.

6.4.3. All other evaluations require the individual to meet the standards identified in paragraph 4.2.2.3.

6.5. Notification . The centrifuge facility chief will notify the aircrew's commander in writing of the aircrew's training and progress. The centrifuge facility chief may recommend flight restrictions for pilots whose centrifuge performance indicates a significantly higher propensity for G-induced problems.

Chapter 7

REPORTING

7.1. Overview. Completion of centrifuge training is documented on the AF Form 702, **Individual Physiological Training Record**, as described in this instruction. Notification of non-completion is also accomplished according to this instruction. The centrifuge training facility will provide an end-of-calendar year report to its MAJCOM/DO and SG which delineates the following (with anonymity):

- 7.1.1. Number of persons (by aircrew mission design series (MDS) and crew position) who attended training by a training program.
- 7.1.2. Number of failures and rate by training program, MDS, and crew position. Consolidate reasons for failures and provide separate list with rates (e.g. GLOC--10 percent, inadequate AGSM--75 percent, poor physical condition--20 percent, etc.).
- 7.1.3. Injuries or medical problems, in association with training, by aircrew MDS.
- 7.1.4. Synopsis of critique comments. Only include comments directed at the overall program or policies. Comments on the facility or its personnel need not be sent forward.
- 7.1.5. Specific comments or recommendations by the facility chief regarding program policy or procedures.

7.2. Videotape Disposition. The videotapes of aircrew centrifuge training are controlled items. The centrifuge training facility will maintain original videotapes according to AFMAN 37-139, *Records Disposition Schedule*. Only the MAJCOM/SG (ANG/SG for ANG aircrew) is authorized to release videotapes outside the MAJCOM/SGP or ANG/SGP. The centrifuge facility will copy only the training profiles for the individual aircrew requested by the MAJCOM/SG or ANG/SG. This copy will be labeled "for official use only" and afforded protection from unauthorized disclosure.

7.3. Individual Records. Units will track initial centrifuge training via AFORMS and individual's flight record. Aircrews will be identified as: initial training required, initial training complete, or MAJCOM/ANG waiver. Aircrew records should be screened annually to determine when the aircrew, if any, on waivers will require refresher training. Units will also develop a method to track refresher training attendance and completion.

- 7.3.1. The centrifuge training facility will maintain individual aircrew training records according to AFMAN 37-139. This will serve as a back-up to unit records.
- 7.3.2. The training reports maintained by the centrifuge facility may be released to the aircrew's commander, MAJCOM/DOT, or MAJCOM/SGP (ANG/DOO/SGP for ANG aircrew). Requests for release of AF Form 699 information to other agencies must be approved by the MAJCOM/DOT or ANG/DOO. These reports are "for official use only" and afforded protection from unauthorized disclosure.

CHARLES H. ROADMAN II, Lt General, USAF, MC
Surgeon General

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

AFPD 11-4, Aviation Service

AFI 11-403, Aerospace Physiological Training Program

AFMAN 37-139, Records Disposition Schedule

AFPAM 11-419, G-Awareness for Aircrew

AETC Syllabus P-V4A-A, Specialized Undergraduate Pilot Training (T-38), Fighter

CNATRA Instruction 1542.121, Advanced Naval Flight Officer (NFO)/ Air Force Navigator (AF NAV) Strike/Fighter (S/F) Training Curriculum

AETC IG F-V5A-A/B-CT-IG, G-Awareness and Centrifuge Training

Abbreviations and Acronyms

ACC—Air Combat Command

AETC—Air Education Training Command

AFB—Air Force Base

AFMOA—Air Force Medical Operations Agency

AFPC—Air Force Personal Center

AGSM—Anti-G Straining Maneuver

ANG—Air National Guard

COMBAT EDGE—Combined Advanced Technology Enhanced Design G Ensemble

DNIF—Duties Not Including Flying

FAIP—First Assignment Instructor Pilot

FTU—Fighter Training Unit

GLOC—G-Induced Loss of Consciousness

HGA—High G Aircraft

HGOA—High G Onset Aircraft

HGOR—High G Onset Rate

IFF—Introduction to Fighter Fundamentals

IP—Instructor Pilot

JSUNT—Joint Specialized Undergraduate Navigator Training

LGOR—Low G Onset Rate

MAJCOM—Major Command

MDS—Mission Design Series

NAF—Numbered Air Force

OPR—Office of Primary Responsibility

PIT—Pilot Instructor Training

SUPT—Specialized Undergraduate Pilot Training

UFT—Undergraduate Flying Training

Terms

G—Any force that produces an acceleration of 32.2 FPS (FPS = Feet Per Second), which is equivalent to the acceleration produced by earth's gravity